Mark schemes

Q1.

(a) 1. Variation/differences due to mutation/s;

2. (Reference to) allopatric (speciation);
Ignore sympatric speciation.

3. Smaller/different lakes have different environmental conditions

OR

Smaller/different lakes have different selection pressures;
Accept different populations for different lakes.

4. Reproductive separation/isolation

OR

No gene flow

OR

Gene pools remain separate;

5. Different alleles passed on/selected

OR

Change in frequency of allele/s;

6. Eventually different species/populations cannot breed to produce fertile offspring;

4 max

(b) 1. Correct answer of 10/10.4 **= 2 marks**;;
Ignore any numbers after 10.4

2. Working shows 14,112 = **1 mark**

OR

13.09/13.1 = **1 mark**;

2

(c) 1. (Growth/increase of) algae/surface plants/algal bloom blocks light;

2. Reduced/no photosynthesis so (submerged) plants die;

3. Saprobiotic (microorganisms) aerobically respire

OR

Saprobiotic (microorganisms) use oxygen in respiration;

Accept: Saprobiont/saprophyte/ saprotroph

Neutral: decomposer

4. Less oxygen for fish to <u>respire;</u>

4

(d) 1. Capture/collect sample, mark and release;

2. Ensure marking is not harmful (to fish)

OR

Ensure marking does not affect survival (of fish);

Accept examples e.g., marking should not be toxic.

3. Allow (time for) fish to (randomly) distribute before collecting a second sample;

4. (Population =) number in first sample × number in second sample divided by number of marked fish in second sample/number recaptured;

4

(e) 1. Less chance of recapturing fish

OR

Unlikely fish distribute randomly/evenly;

Accept 'harder to capture marked fish' (recaptured fish) but ignore 'harder to capture fish'.

Accept that fish may remain in one area.

Accept fish may congregate.

1

[15]

Q2.

(a) 1. (Colonisation by) <u>pioneer species</u>;

2. Pioneers/species/organisms change the environment/habitat/conditions/factors;

Accept example of change e.g. forms soil/humus/organic matter/nutrients.

Must convey idea of change being caused by pioneers/species/organisms

3. (Environment becomes) less <u>hostile</u> for other/new <u>species</u>
OR
(Environment becomes) more <u>suitable</u> for other/new <u>species</u>
OR
(Environment becomes) less <u>suitable</u> for previous <u>species</u>;

Accept previous <u>species</u> out-competed.

4. Change/increase in <u>diversity/biodiversity</u>;

Ignore increase in genetic diversity.

5. (To) climax community;

4 max

Q3.

(a) 1. Use a grid
OR
Divide area into squares/sections;

Accept use of tape measures/map/area with coordinates.

Accept Belt transect.

2. Method of obtaining random coordinates/numbers e.g. calculator/computer/random numbers table/generator;

If transect method used accept quadrats at regular intervals or current mark point 2.

3. Count number/frequency in a quadrat/section;

Accept % cover in quadrat/section.

Ignore amount/abundance.

4. Large sample **and** calculate mean/average number (per quadrat/section);

*Accept large sample **and** calculate mean %.*

*Accept large sample **and** method of calculating mean.*

Accept many/multiple for large sample but ignore several.

If a specific number is given it must be 10 or more.

5. Valid method of calculating total number of sundews, e.g. mean number of plants per quadrat/section/m^2 multiplied by number of quadrats/sections/m^2 in marsh;

Do not allow 'scale up' without further qualification.

Do not award if % cover determined.

5

(b)

***Mark in pairs** 1 and 2, or 3 and 4.*

Ignore carbohydrates, lipids or named carbohydrate/ lipid.

1. Digestion/breakdown of proteins;

2. Provides amino acids
OR
(Sundew can) produce a **named** (organic) nitrogen-containing compound e.g. proteins, amino acids, DNA, ATP;

Ignore if nitrate or ammonium ions given as products.

3. Digestion/breakdown of **named** (organic) phosphate-containing compound e.g. DNA, RNA;

4. Provides **named** (organic) phosphate-containing product e.g.

nucleotides
OR
(Sundew can) produce a **named** phosphate-containing compound e.g. ATP, DNA;

Accept phosphate as a named product.

2 max

[7]

Q4.

(a) 1. Method of randomly determining position (of quadrats) e.g. random numbers table/generator;

Ignore line/belt transect

2. Large number/sample of quadrats;

Accept many/multiple

Ignore point quadrat

If a specified number is given, it must be 20 or more

3. Divide total percentage by number of quadrats/samples/readings;

3

(b) 1. Beach grass is the pioneer (species);

2. Pioneers/named species change the (abiotic) environment/habitat/conditions/factors;

Must convey idea of change being caused by a species

Accept example of change e.g. more humus

3. (So) less <u>hostile</u> for named species
OR
(So) more <u>suitable</u> for named species;

4. Conifer/hardwood trees represent climax community;

4

(c) Trees block/reduce (sun)light;

Reject 'blocks' all of the light

1

Q5.

(a) 1. Compete (with fertile males) to mate / for food / resources
OR
<u>intraspecific</u> competition;

2. Do not reproduce / breed
OR
Reduces population (of mosquitoes);

1. Must convey idea of competition.

2. Accept: 'fewer mosquitoes' / 'fewer offspring'.

2

(b) 1. Capture / collect / sample, mark **and** release;
2. Leave time for mosquitoes / Aedes to disperse before second sampling / collection;
3. (Population =) number in first sample × number in second sample divided by number of marked in second sample / number recaptured;

3. Accept: correct equation.

3

(c) (Radiation) affects their 'attractiveness' / courtship / survival / life span;

*Accept: 'die / less likely to survive **due** to radiation'.*

Accept: 'disease can be transmitted by other means' (other than mosquitoes).

1

(d) To maintain number / competition as they die / have a short life span;

Accept: to replace mosquitoes that have died.

1

(e) 1. Number (of mosquitoes in treated area) is low / lower at / after 12/13/14/15/16 weeks = **2 marks**;

2. For one mark accept number (of mosquitoes in treated area) is low/lower without reference to relevant week;

Accept: amount for number.

Accept: comparison of numbers (of mosquitoes) for lower/low.

2

[9]

Q6.

(a) 1. (Overall, data show an) increase in species richness / increase in species diversity / increase in total number of living organisms;

2. *Baetis quilleri* and / or *Pentaneurini guttipennis* are pioneers;

3. (Pioneers cause) named change of environment e.g. provide food for other species;

4. New species / example from data colonise once there is a change;

5. *Baetis quilleri* / *Pentaneurini guttipennis* / *Helicopsyche mexicana* decline / outcompeted / eaten as succession continues.

5

(b) Correct answer 5.5 = 2 marks;

Allow 1 mark for correct calculation of mean population growth rate per day for each species, i.e:

Cryptolabis paradoxa = 3.226

Leptohyphes packeri = 0.585

2

(c) 1. Same species present (over long time) / stable community (over long time);

2. Abiotic factors (more or less) constant (over time)

3. Populations stable (around carrying capacity)

2 max

[9]

Q7.

(a) 1. Only cleared and abandoned and introduction of non-native species make (significant) difference;

2. Because only (means of) these ± 2 SDs from zero / no change;

3. About same number / 4 to 3 increase or decrease (species) richness / biodiversity;

Accept converse for others

3

(b) 1. Non-native species out-competes / kills / eats / is a disease of native plants;

2. Some (populations of) native species become extinct (in the community);

2

(c) 1. Set up grid system with coordinates;

2. Place large number of quadrats (at coordinates) selected at random;

3. Count number of / estimate percentage cover of native plant in quadrats;

3. Repeat at same time each year (for many years);

3 max

(d) 1. Correct answer two marks – 0.0599;

1 mark for writing $\frac{\log_e(SR2/SR1)}{\text{Time in decades}}$

Award 1 mark for answer of – 5.985 or 0.290

2

[10]

Q8.

(a) Interspecific (competition);

1

(b) 1. Do not provide the livestock/cows/horses/yaks with extra food, **as**

their populations will not grow large enough to cause competition

OR

Keep small numbers of livestock/cow/horse/yak, **so** their populations will not grow large enough to cause competition;

*Requires suggestion **and** explanation for each mark*

2. Do not farm horse/choose animals other than horse to farm, **as** they have the same habitat **and** (very) similar food to the ibex;

   *Accept farm fewer horses **as** they have the same habitat **and** (very) similar food to the ibex*

3. Keep horses (but) in enclosed/separate areas, **as** they occupy the same habitats as ibex;

   Accept descriptions of enclosed areas, eg fenced areas or accept do not let horses out

4. Farm cows, **as** they have the least similar food **and** (one of the least similar) habitat (to that of the ibex);

5. Farm yaks, **as** despite eating the same food, they live in a very different habitat;

6. (Only) grow crops, **so** no competition;

   Accept examples of crops

3 max

[4]